## REMARKS

Claims 1 and 25 have been amended to correct minor typographical errors; Claims 1, 3-8, 11-13, 15-18, 20-30 and 32-34 are rejected under 35 U.S.C. §101 because the claim language as cited is essentially directed towards an algorithm; claims 1, 3-8, 11-13, 15-18, 20-30 and 32-34 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1-29 of co-pending application No. 10/614,260; claims 1, 3, 18, and 20 are rejected under 35 U.S.C. §102(b) for alleged anticipation over IEEE (*Kisel et al* publication).

## I.    INTRODUCTION

This communication is a full and timely response to the final Office Action dated July 1, 2008.  Claims 1, 3-8, 11-13, 15-18, 20-25, 28-30, and 32-34 remain pending, claims 2, 9, 10, 14, 19, 26, 27, and 31 were previously cancelled.  By this communication, claims 1 and 25 are amended.  Reconsideration and allowance of this application are respectfully requested.

## II.    THE CLAIM OBJECTIONS SHOULD BE WITHDRAWN

In numbered paragraph 1 on page 2 of the Office Action, claims 1 and 25 stand objected to for alleged typographical errors.  Applicants have amended the claims to address the Examiner's concerns.  Accordingly, Applicants respectfully request that the objection to claims 1 and 25 be withdrawn.

## III. THE 35 U.S.C. §101 REJECTION SHOULD BE WITHDRAWN

In numbered paragraph 2 on page 2 of the Office Action, claims 1, 3-8, 11-13, 15-18, 20-25, 28-30, and 32-34 stand rejected under 35 U.S.C. §101, as being directed towards an algorithm. (See Id., pp. 2-3, ¶2). Specifically, the Examiner asserts that none of the claim language suggests a hardware implementation of the claimed steps. (See Id.) Applicants respectfully traverse this rejection.

Regarding claims 1, 3-8, 11-13, 15, and 16, Applicants' note that these claims are directed to a method or process. 35 U.S.C. §101, states: "Whoever invents or discovers any new and useful *process*. . .may obtain a patent therefore, subject to the conditions and requirements of this title." Moreover, with respect to mathematical algorithms, the MPEP states:

> Claims to processes that do nothing more than solve mathematical problems or manipulate abstract ideas or concepts are complex to analyze and are addressed herein.
>
> If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Gottschalk v. Benson, 409 U.S. 63, 71-72, 175 USPQ 673, 676 (1972). Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.
>
> In practical terms, claims define nonstatutory processes if they:
>
> -consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
>
> -simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.2d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.2d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

See MPEP 2106.02

In view of the foregoing, it appears the Examiner has incorrectly surmised that the claimed invention provides has no practical application and simply manipulates abstract ideas. Applicants' claim 1 recites, among other features, "generating a chaotic signal," "transmitting said chaotic signal," and "receiving the chaotic signal." One of ordinary skill would understand that the combination of at least these features do much more than manipulate abstract ideas or concepts. Applicants' claimed combination of features also embodies a practical application.

Similarly, independent method claim 8 recites, among other features, "transmitting the value k" and "generating a chaotic signal." While independent method claim 13 recites at least the features of "receiving the chaotic signal" and "demodulating the chaotic signal." As shown, each of claims 1, 8, and 13 are comprised of features that result in practical applications such that the claimed embodiment is statutory.

Independent claim 18 is directed to a system that comprises a transmitter and a receiver. On page 2 of the Office Action, the Examiner appears to assert that this claim is non-statutory because the steps "could be simply implemented in software as program modules." (See 05/01/08 Office Action, p. 3, ¶2).

The Examiner's rationale in making the rejection is that the claims do not appear to comprise any hardware elements. Applicants disagree and respectfully submit that the PTO's reasoning is not a proper basis for a finding that claims are non-statutory. Applicants' claimed combination of elements recited in the device for creating an analytical mesh file of claim 5 are statutory as supported by the Federal Circuit decision discussed below.

In *State Street Bank & Trust, Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998), the claims were directed to a data processing system (the system) for implementing an investment structure which was developed for use in Signature's business as an administrator and accounting agent for mutual funds. In essence, the system, identified by the proprietary name Hub and Spoke®, facilitated a structure whereby mutual funds (Spokes) pool their assets in an investment portfolio (Hub) organized as a partnership. The investment configuration provided the administrator of a mutual fund with the advantageous combination of economies of scale in administering investments coupled with the tax advantages of a partnership. *State Street Bank & Trust*, 149 F.3d at 1370. Specifically, the job of the device was to replace the need of a fund administrator to "calculate the value of the shares to the nearest penny within as little as an hour and a half after the market closes." *Id.*

The Federal Circuit found that the claims were <u>valid</u> under 35 U.S.C. § 101. The court explained that under 35 U.S.C. § 101 <u>any</u> process, machine, manufacture, composition of matter, or any improvement thereof, was statutorily patentable subject matter, *i.e.*, anything under the sun. *See Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980). The court goes on to say that "the repetitive use of the expansive term 'any' in § 101 shows Congress's intent not to place any restrictions on the subject matter for which a patent may be obtained beyond those specifically recited in § 101." *State Street Bank & Trust, Co.* 149 F.3d 1368, 1373. However, the court noted two exceptions to § 101, which are, namely, the Mathematical Algorithm Exception and the Business Method Exemption. *Street Bank & Trust, Co.*, 149 F.3d 1368, 1372 (Fed. Cir. 1998).

With regard to the Mathematical Algorithm Exception, the court stated that "[o]f particular relevance to this case, the Court has held that mathematical algorithms are not patentable subject matter to the extent that they are merely abstract ideas." *Id.* at 1373. The court went on to say that "certain types of mathematical subject matter, <u>standing alone</u>, represent nothing more than abstract ideas until reduced to some type of practical application, i.e., 'a useful, concrete and tangible result.'" *State Street Bank & Trust, Co.* 149 F.3d 1373 (citing *In re Alappat*, 33 F.3d 1526, 1544 (Fed. Cir. 1994) (emphasis added). Further, the *State Street Bank & Trust, Co.* court recited that "[u]npatenable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not 'useful.'" *Street Bank & Trust, Co.* 149 F.3d 1373.

The court in *State Street Bank & Trust, Co.* ruled that the claims were valid because, although they were to a mathematical algorithm, they were to <u>a machine</u> that produced a result. They stated that "Today, we hold that the ***transformation of data***, representing discrete dollar amounts, ***by a machine*** through a series of mathematical calculation into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' - a final share price momentarily fixed for recording and reporting purposes..." *Id.* The court makes a final note in support of its conclusion that the mathematical algorithm is statutory subject matter and states that "After all, as we have repeatedly stated, every step-by-step process, be it electronic or chemical or mechanical, involves an algorithm in a broad sense of the term." *Id* at 1374.

The patent in *State Street Bank & Trust v. Signature Financial Group*, 47

USPQ2d 1596 (Fed. Cir. 1998) claims a practical application. Claim 1 of *State*

*Street* claims a "data processing system" that includes a plurality of means for

processing data. The Federal Circuit determined that the claim claims a "machine"

in accordance with 35 U.S.C. §101. The Court then went on to analyze the claim to

determine whether the machine fell into an exception to the statutory subject matter.

The *State Street* decision held that certain types of mathematical subject

matter, standing alone, represent nothing more than abstract ideas **until reduced to**

**some type of practical application**, i.e., "a useful, concrete and tangible result". *Id.*

at 1600 -01 (emphasis added). The Court went on to "...hold that the transformation

of data, representing discrete dollar amounts, by a machine through a series of

mathematical calculations into a final share price, constitutes a practical application

of a mathematical algorithm, formula, or calculation, because it produces 'a useful,

concrete and tangible result' – a final share price momentarily fixed *for recording and*

*reporting purposes...*" *Id.* at 1601. (emphasis added). It is important to note claim 1

in *State Street* did not include any provisions for recording or reporting the data,

even though that is the practical application relied upon by the Court. The claim was

deemed useful because the calculated data could be useful for purposes such as

"recording and reporting purposes", even though the claim itself did not include the

acts or means for recording or reporting the data. The mere calculation of data

deemed useful was sufficient.

Accordingly, under *State Street*, a **machine** capable of producing useful data

was deemed statutory, even though the machine as claimed did not itself use the

data. With this background, the practical applications disclosed in the present application will be discussed.

Claim 18 recites a system transmitting and receiving a digital message having N digits. The claimed device includes a number of components that in combination enable the device to demodulate a chaotic signal. The holding in *State Street* establishes that the transformation of data into a form that can be used for a useful purpose is statutory subject matter. *Id.* at 1601. In its ruling, the Federal Circuit did not require that the machine include or the claim recite "hardware elements" as alleged by the PTO. However, Applicants' recitation of a transmitter and receiver can reasonably be considered as "hardware elements". It would appear that a claim reciting a machine that transforms data into a tangible result would inherently include various components or mechanisms to achieve the claimed result. Even still, Applicants' respectfully submit that the block diagram of Applicants' Figure 1 and the corresponding disclosure describe an embodiment that one of ordinary skill would recognize as being capable of implementation through any of a number of devices including a transmitter and receiver as claimed. Based on the foregoing discussion and the guidance provided by the Federal Circuit in its *State Street* ruling, Applicants' respectfully submit that claim 18 is statutory.

Claims 18 and 20-24 relate to a system including a transmitter and a receiver; claims 25, 28 and 29 pertain to a transmitter; and claims 30, and 32-34 pertain to a receiver. Because each of these claims directly or indirectly depends from claim 18, and each are clearly directed to "hardware," Applicants respectfully submit that they are likewise statutory for the same reasons discussed above. For at least the

foregoing reasons, it is respectfully submitted that the rejection to claims 1, 3-8, 11-13, 15-18, 20-25, 28-30 and 32-34 under 35 U.S.C. § 101 should be withdrawn.

## IV.    DOUBLE PATENTING REJECTIONS

In numbered paragraph 3 on page 3 of the Office Action, claims 1, 3-8, 11-13, 15-18, 20-25, 28-30 and 32-34 stand rejected on the ground of non-statutory obviousness-type double patenting for alleged unpatentability over claims 1-29 of co-pending U.S. Patent Application No. 10/840,601.  (See, 05/01/08 Office Action, pp. 3-5, ¶3).  Applicants' respectfully requests that the double-patenting objection be held in abeyance until the scope of the claims in either of the present application or co-pending application are settled.

## V.    THE 35 U.S.C. §102(b) REJECTION SHOULD BE WITHDRAWN

Claims 1, 3, 18 and 20 stand rejected under 35 U.S.C. §102(b) for alleged anticipation by Kisel, Dedieu and Schimming, "Maximum Likelihood Approaches for Noncoherent Communications with Chaotic Carriers," IEEE Transactions on Circuits and Systems -I:  Fundamental Theory and Applications, Vol. 48, No. 5, May 2001) (hereinafter "Kisel").  (See Id, pp. 5-6, ¶ 4).

Applicants would like to draw the Examiner's attention firstly to the text at page 538-539 of Kisel, which describe the functionality of the chaotic generators in the transmitter as follows:

> The choice of generator 1 (map $M_1$) is arbitrary.  The choice of
> generator 2 (map $M_2$) should provide us with chaotic signals
> with the same distributions as generator 1 and with same
> spectrum bandwidth.  However, the transition probability matrix
> of generator 2 should be different enough to make the two
> likelihood measures defined in (30) and (31) are discriminant.

$$\gamma_1 = p\,(S,Y|M_1) = \prod_{\lambda+1}^{N} p\,(sk\,|(sk - L_7\; M_1))p(\,Yk|sk\,) \tag{30}$$

$$\gamma_2 = p\,(S,Y|M_2) = \prod_{\lambda+1}^{N} p\,(sk\,|(sk - L_7\; M_2))p(\,Yk|sk\,) \tag{31}$$

According to *Kisel*, the functionality requires that chaotic signals have the same distributions or the same spectral bandwidth. In addition, *Kisel* requires a probability matrix of the generator to be different enough in order to make the two likelihood measurements defined in the discriminant of (30) and (31). Furthermore, *Kisel* requires the maps to map the same point into two points separated by a factor of ½.

In contrast Applicants' claims recite, among other features, "a $k^{th}$-chaotic signal generator having chaotic characteristic value associating with a chaotic algorithm." *Kisel* fails to teach or suggest this limitation. According to one exemplary embodiment, y = m [0.5-2|x|] when m is the characteristic value.

Now, turning the Examiner's attention to page 539 of *Kisel*, the text reads as follows:

> At the receiver end, the demodulation is performed by two ML decoders. One of these decoders (V $D_1$ in Fig. 7) is tuned for $M_2$ and calculates its likelihood measure $\gamma_1$ by computing (30). the second one (V $D_2$) is tuned for map $M_2$ and therefore compute its likelihood measure $\gamma_2$ by using (31). The decision is made by simple comparison of the two likelihood measures. If $\gamma_1$ is greater than $\gamma_2$, then the bit associated with system M1 is most likely to have been transmitted.

Based on the foregoing, one of ordinary skill would understand that *Kisel* teaches a demodulation technique using two ML decoders. In contrast to *Kisel*, the receiver recited in the claims utilizes a single decoder for decoding purposes. Similarly, *Kisel* performs a demodulation using two ML decoders while Applicants' claims use a single decoder. It is important to further note that decoder according to the claims in question is **not** a ML decoder.

Yet a further readily apparent distinction between *Kisel* and Applicants' claimed embodiments resides in the fact that each of the two ML decoders of *Kisel* computes a likelihood measure based on a received chaotic signal. The claimed embodiments, on the other hand, utilize a single decoder to evaluate the chaotic characteristic value of the received chaotic signal. The receiver according to *Kisel* makes a decision by comparing the two likelihood measures. However, the decoder of the Applicants' claimed embodiment matches the evaluated chaotic characteristic value with the chaotic characteristic values stored in the receiver. Specifically, claims 1 and 18 recite, among other features, "matching the evaluated chaotic characteristics value of the received chaotic signal with the chaotic characteristic values stored in the receiver."

Furthermore, Applicants respectfully submit that the claims in question are also entirely distinguishable, functionally, from the cited DCSK system of *Kisel*. In particular, at page 540, *Kisel* discloses the functioning of the DCSK as follows:

> Until now one of the most efficient communication schemes with chaos is based on differential chaos shift keying (DCSK) [23], [24]. In this scheme, the information is encoded as a phase shift in a chaotic waveform. The carrier associated with the first half bit duration is a chaotic one (pilot signal) while the carrier corresponding to the second half is simply $\pm 1$ times the pilot signal, the sign depending on the binary information to be transmitted. At the receiver, the binary

information is recovered by correlating the received signal
with its delayed version, the delay being one half of the bit
duration [23], [24].

Initially, it should be pointed out that in the DCSK system the chaotic carrier
transmits a pilot signal during the first half bit duration and transmits =/- times the
pilot signal during the second half bit, the sign depending on the binary information to
be sent. According to *Kisel* teaches that only one chaotic generator is needed for a
binary (M=2) system. In contrast to *Kisel*, only two chaotic generators are utilized to
transmit binary (M=2) information.

Furthermore, at the DCSK receiver, correlation of the received signal delayed
by one half of the bit duration is needed to recover the information. In contrast, the
decoder recited in Applicants' claims evaluates the chaotic characteristic value of the
received chaotic signal and matches the evaluated chaotic characteristic value with
the chaotic characteristic values stored in the receiver.

In summary, claims 1 and 18 of the present application are not anticipated by
*Kisel*, because of the distinguishing features discussed above. Accordingly,
Applicants' respectfully submit that this rejection be withdrawn. As claims 3 and 20
depend from, and therefore include all the limitations of claims 1 and 18,
respectively, it is hereby submitted that these claims are allowable.

Claims 6 and 23 stand further rejected under 35 U.S.C. §102(b) as being
anticipated over *Kisel*. (See Id, p. 7, ¶¶ 6-7). As claims 6 and 23 depend from, and
therefore include all the limitations of claims 1 and 18, respectively, it is hereby
submitted that these claims are also allowable for at least the reasons stated above.

## VI.     THE 35 U.S.C. § 103(a) REJECTION SHOULD BE WITHDRAWN

Applicants' claims were variously rejected under 35 U.S.C. §103. For example, claims 6 and 23 are rejected under 35 U.S.C. §103(a) for alleged obviousness over *Kisel*; and claims 4-5, 8, 11-13, 15-17, 21-22, 25, 28-30 and 32-34 are rejected under 35 U.S.C. §103(a) for alleged obviousness over *Kisel*, in view of *Umeno* (U.S. Patent No. 6,661,831) and *Menezes et al) (Menezes* publication). (See Id, p. 7, ¶¶ 6-7). Regarding claims 6, 7, 23, and 24, because *Kisel* fails to teach or suggest all the limitations of amended independent claims 1 and 18. It is respectfully submitted that the portions of the alleged implied information provided by the Examiner is insufficient to cure the above-stated deficiencies of *Kisel*. Since claims 6 and 23 depend from, and therefore include all the limitations of claims 1 and 18, respectively, it is hereby submitted that these claims are also allowable for at least the reasons stated above.

Regarding, claims 4, 5, 8, 11-13, 15-17, 21, 22, 25, 28-30, and 32-34 *Umeno* and *Menezes* are insufficient to cure the above-stated deficiencies of *Kisel*. Because dependent claims 4 and 5 depend from, and, therefore include all the limitations of independent claim 1, it is respectfully submitted that claims 4 and 5 are allowable for the reasons stated above with reference to claim 1. Because dependent claims 21 and 22 depend from, and, therefore include all the limitations of independent claim 18, it is respectfully submitted that claims 21 and 22 are allowable for the reasons stated above with reference to claim 18.

Regarding claims 8, 13, 18, 25, and 30, each claim recites, *inter alia,* "A method for transmitting and receiving a digital message having *N* digits, each of said

*N* digits having any one of *M* values in a system, wherein each of said *M* values *k*

corresponds with a *k*<sup>th-</sup> ***chaotic signal generator having chaotic characteristics***

***value associating with a chaotic algorithm*** and is transmitted within a bit period

including the steps of . . . ***evaluating the chaotic characteristics value of the***

***received chaotic signal . . .***" (Emphasis added). It is respectfully submitted that

*Umeno* and *Menezes* are insufficient to cure the above-stated deficiencies of *Kisel*.

Therefore, Applicant respectfully submits that these claims are allowable for at least

the reasons discussed above with regard to claim 1. Furthermore, that neither *Kisel*

nor *Umeno* nor *Menezes* nor any combination of the three teach or suggest the

steps of (a) inputting a random number to the chaotic algorithm to generate a first

chaotic number; (b) inputting the first chaotic number to the chaotic algorithm to

generate a second chaotic number; and (c) repeating step (b) using the second

chaotic number as the first chaotic number until all numbers to be transmitted within

the bit period are generated. Accordingly, it is respectfully submitted that the further

rejection to claims 4, 8, 13, 21, 25, and 30 under 35 U.S.C. §103(a) and their

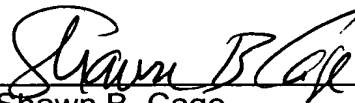corresponding depending claims be withdrawn.

## CONCLUSION

In light of the foregoing, Applicants respectfully submit that all of the now pending claims are allowable and this application is in condition for allowance. All issues raised by the Examiner having been addressed. An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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